

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



Applicants: K. MIKI, et al

Serial No.: 10/750,859

Filed: January 5, 2004

For: STORAGE DEVICE SYSTEM HAVING BI-DIRECTIONAL
COPY CONTROL FUNCTION

PETITION TO MAKE SPECIAL
UNDER 37 CFR §1.102(MPEP §708.02)

MS Petition

Commissioner for Patents
 P.O. Box 1450
 Alexandria, VA 22313-1450

June 29, 2005

Sir:

Applicants hereby petition the Commissioner to make the above-identified application special in accordance with 37 CFR §1.102(d). Pursuant to MPEP §708.02(VIII), Applicants state the following.

(A) This Petition is accompanied by the fee set forth in 37 CFR §1.17(h).

The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

(B) All claims are directed to a single invention.

If the Office determines that all claims are not directed to a single invention, Applicant will make an election without traverse as a prerequisite to the grant of special status.

(C) A pre-examination search has been conducted.

The search was directed towards a storage system. In particular, the search was directed towards a storage device system in a computer system having a plurality of superior devices and a plurality of storage device systems for receiving write-in data from at least one of the superior devices.

According to the present invention, the storage device includes a physical storage device, responsive to a logical volume which is controlled so that identical data is saved across the plurality of storage device systems, for storing data on the logical volume, a device for saving the time of reception on which writing data was received from a superior device, a communication interface device for transmitting write-in data addressed to the logical volume and a corresponding reception time to another storage device system and for receiving write-in data and corresponding reception time from the storage device system and a data consistency holding control device for affecting control to write write-in data which was received from the superior device and write-in data which was received through the communication interface device into the physical storage device after such write-in data has made to wait in a temporary storage device for more than a predetermined time from the reception time corresponding to the write-in data to the logical volume, so that, when write-in data which was received from the superior device and write-in data which was received through the communication interface device are written in an overlapped manner into the same storage location of the physical storage device, they are written in the order of the reception time thereof.

The search of the above features was conducted in the following areas:

<u>Class</u>	<u>Subclass</u>
707	200-204
709	217-219
711	100, 111-114, 118, 161-165
714	5-7

Additionally, a computer database search was conducted on the USPTO systems EAST and WEST.

(D) The following is a list of the references deemed most closely related to the subject matter encompassed by the claims:

<u>U.S. Patent Number</u>	<u>Inventors</u>
5,504,861	Crockett et al
6,052,758	Crockett et al
6,148,383	Micka et al
6,463,501	Kern et al
6,487,645	Clark et al
6,647,474	Yanai et al
6,701,455	Yamamoto et al
6,816,951	Kimura et al
6,871,271	Ohran et al

A copy of each of these references (as well as other references uncovered during the search) is enclosed in an accompanying IDS.

(E) It is submitted that the present invention is patentable over the references for the following reasons.

It is submitted that the cited references, taken individually or in combination with each other, fail to teach or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to teach or suggest in combination with the other limitations recited in the claims:

a first feature of the present invention as recited in independent claims 1 and 5, wherein a device is provided for saving the time of the section on which write-in was received from a superior device,

a second feature as recited in independent claim 1, wherein a data consistency holding control device is provided for affecting control to write write-in data which was received from the superior device and write-in data which was received through the communication interface device into the physical storage device after such write-in data has been made to wait in a temporary storage device for more than a predetermined time from the reception time corresponding to the write-in data to the logical volume, and

a third feature of the present invention as recited in independent claim 5, wherein a data consistency holding control device is provided for effecting control with reference to the table to write write-in data to the logical volume for which more than a predetermined time has passed from the reception time into the physical storage device in the order of the older reception.

The references considered most closely related to the claimed invention are briefly discussed below:

Crockett (U.S. Patent No. 5,504,861) discloses a method and system for real-time remote copying of direct access storage device (DASD) data. The system provides an improved design and method for shadowing write updates at a primary site to a secondary site such that writes to the secondary site are optimized with full recovery capabilities. The method includes a step for shadowing record updates, where the record updates are transmitted asynchronously from a primary site to a secondary site. The secondary site includes secondary storage devices providing disaster recovery capabilities

for the primary site, where the record updates are assembled in consistency groups for shadowing the record updates in real time and in a sequence consistent order. A primary data mover collects sets of record updates and corresponding record set information into self describing record sets, the self describing record sets further being assembled into consistency groups where each record update is ordered according to a primary system synchronized time-stamp. The primary data mover asynchronously transmits the self describing record sets to the secondary system in real time. The secondary system includes a secondary processor for receiving the transmitted self describing record sets, and a secondary storage subsystem for shadowing the record updates. A secondary data mover is coupled to the secondary processor optimizing secondary I/O operations for each consistency group of record updates for storing each record update in sequence consistent order. (See, e.g., Abstract and column 2, line 59, through column 3, line 40).

However, unlike the present invention, Crockett '861 does not teach or suggest that the storage device system has a table in which the reception times corresponding to each write-in data which is waiting in the temporary storage device are arranged in the order from an older one, and a device for searching write-in data to determine for which data said more than the predetermined time has passed from the reception time. More particularly, Crockett '861 fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in

independent claim 5 in combination with the other limitations recited in each of the independent claims.

Crockett (U.S. Patent No. 6,052,758) discloses a system for detecting and isolating errors in a direct access storage device. The system isolates errors in a remote copy system. A first controller writes data to a volume in a first direct access storage device (DASD) and maintains a copy of the data in a cache. The first controller transfers the data in the cache to a host system via a first communication line. The host system then transfers the data transferred from the first controller to a second controller via a second communication line. The second controller writes the data transferred from the host system to a volume in a second DASD. A volume pair is comprised of a volume in the first DASD and a volume in the second DASD, where for each volume pair, the second DASD volume backs-up data stored in the first DASD volume. If an error related to a volume pair is detected, then the operation of transferring the data in the cache for the volume pair related to the error to the second controller via the host system is suspended. Information on the detected error is written to a first data set. Further, after the transfer of data from the cache is suspended, information on a location of data written to the first DASD volume in the volume pair related to the error is written to a second data set. The information in the second data set is used to determine the location of data written to the first DASD volume of the volume pair related to the error while the transfer of the data to the second DASD volume of the volume pair is suspended. Upon correction of the error related to the volume pair, data written to the first DASD volume at the determined location is transferred to the second storage controller via the host

system for storage in the second DASD volume of the volume pair. The system also includes a data mover that time stamps data updates in the primary DASD to insure that updates are done in the secondary DASD in the same order as they were done in the primary DASD. (See, e.g., Abstract, column 1, line 59, through column 2, line 33, and column 4, lines 27-43).

However, unlike the present invention, Crockett '758 does not teach or suggest that the storage device system has a table in which the reception times corresponding to each write-in data which is waiting in the temporary storage device are arranged in the order from an older one, and a device for searching write-in data to determine for which data said more than the predetermined time has passed from the reception time. More particularly, Crockett '758 fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Micka (U.S. Patent No. 6,148,383) discloses a data storage system that employs a universal timer to perform asynchronous peer-to-peer data mirroring. Generally, this is achieved by primary and secondary controllers cooperatively performing periodic consistency checks according to the universal timer. The peer-to-peer backup system of the invention includes a primary storage site and a secondary storage site. There are multiple primary storage sub-sites each having a counterpart secondary storage sub-site. Each sub-site, both primary and secondary, is in communication with a

universal timer, such as a global positioning system (GPS). Each primary sub-site receives ordered data updates, and stores the updates at the primary sub-site in that order, optionally time stamping each update to designate its storage time according to the universal timer. Each primary sub-site also transmits the updates and corresponding time stamps to its counterpart secondary sub-site. Each secondary sub-site receives updates from its counterpart primary storage sub-site and stores the updates to a journal of the secondary sub-site. Whenever a periodic timer interval of the universal timer expires, several things happen. Each primary sub-site sends its counterpart secondary sub-site a confirmation message identifying updates sent in the expired interval. Also in response to the interval expiration, each secondary sub-site checks for receipt of the confirmation message. If no confirmation message has been received, the secondary sub-site takes a predefined action, such as waiting, entering a suspended state, or executing a predefined disaster recovery routine. Only if the confirmation message has been received does the secondary sub-site check the journal for presence of all updates identified by the confirmation message; if present, the secondary sub-site commits the journaled updates to secondary storage. (See, e.g., Abstract and column 2, line 33, through column 3, line 32).

However, unlike the present invention, Micka does not teach or suggest that the storage device system has a table in which the reception times corresponding to each write-in data which is waiting in the temporary storage device are arranged in the order from an older one, and a device for searching write-in data to determine for which data said more than the predetermined time has passed from the reception time. More particularly,

Micka fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Kern (U.S. Patent No. 6,463,501) discloses a method and system for insuring data consistency across groups of storage areas and, in particular, insuring data consistency in a mass storage device comprised of a plurality of storage systems. Each update has an update time the update was made. There are multiple groups of data storage areas. For each group, updates to the data storage area in the group are stored in a journal for storing updates to the group, where there are multiple journals. An indication is made in a memory area for each group of a group update time comprising a most recent update time of the updates in the group. The update time for each update in the group is not greater than the group update time. A determination is made of a minimum group update time across all the groups. At least one update is applied to storage if the update time for the update does not exceed the minimum group update time. The data storage areas may be partitioned among a plurality of computer systems, and may be maintained in at least one primary and secondary storage. The data storage areas may also comprise volumes, with each group including at least one volume. The groups of updates may also be maintained in a journal. (See, e.g., Abstract and column 2, line 64, through column 3, line 40).

However, unlike the present invention, Kern does not teach or suggest that the storage device system has a table in which the reception times corresponding to each write-in data which is waiting in the temporary storage device are arranged in the order from an older one, and a device for searching write-in data to determine for which data said more than the predetermined time has passed from the reception time. More particularly, Kern fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Clark (U.S. Patent No. 6,487,645) discloses a method and apparatus for employing a fairness approach to selectively allow or reject updates to a data storage subsystem, in order to avoid overrunning the data storage subsystem's update buffer. When a primary data storage subsystem receives updates for local storage and backup at a counterpart secondary storage subsystem, the primary subsystem institutes device-specific, fairness-driven update blocking to avoid overrunning the primary subsystem's update buffer with updates destined for any one physical or logical device. The primary subsystem initially receives update requests, logs the updates in an update buffer, stores the logged updates in primary storage, and finally copies the updates to the secondary storage subsystem. Each update request includes update data and also identifies a corresponding logical device, physical device, or other targeted subpart of primary storage. The primary subsystem

maintains a counter or other update activity indicator that represents update activity for each storage subpart. The update activity may comprise the number or size of updates contained in the buffer for that subpart. For each update request, the primary subsystem consults the update activity indicator to determine whether the identified subpart's update activity exceeds a prescribed level. If not, the update data is stored in primary storage. Otherwise, if the update activity is excessive, the primary subsystem rejects the update. Optionally, the primary subsystem may selectively override certain rejections to prevent starving updates for that subpart. (See, e.g., Abstract and column 2, line 43, through column 3, line 29).

However, unlike the present invention, Clark does not teach or suggest a data consistency holding control device for effecting control to write write-in data which was received from the superior device and write-in data which was received through the communication interface device into the physical storage device after such write-in data has been made to wait in a temporary storage device for more than a predetermined time from the reception time corresponding to the write-in data to the logical volume, so that when write-in data which was received from the superior device and write-in data which was received through the communication interface device are written in an overlapped manner into the same storage location of the physical storage device, they are written in the order of the reception time thereof. More particularly, Clark fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as

recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Yanai (U.S. Patent No. 6,647,474) discloses a data storage system and method for automatically providing and maintaining a copy or mirror of data stored at a location geographically remote from the main or primary data storage device. The invention features a system which automatically, without intervention from a host computer system, controls storing of primary data received from a primary host computer on a primary data storage system, and additionally controls the copying of the primary data to a secondary data storage system controller which forms part of a secondary data storage system, for providing a back-up copy of the primary data on the secondary data storage system which is located in a geographically remote location from the primary data storage system. At least one of the primary and secondary data storage system controllers coordinates the copying of primary data to the secondary data storage system and at least one of the primary and secondary data storage system controllers maintains at least a list of primary data which is to be copied to the secondary data storage device. At least one of the primary data storage system controller and the secondary data storage system controller maintains a list of primary data which is to be written to the secondary data storage system. (See, e.g., Abstract and column 2, line 26, through column 3, line 43).

However, unlike the present invention, Yanai does not teach or suggest a data consistency holding control device for effecting control to write write-in data which was received from the superior device and write-in data which was received through the communication interface device into the physical storage

device after such write-in data has been made to wait in a temporary storage device for more than a predetermined time from the reception time corresponding to the write-in data to the logical volume, so that when write-in data which was received from the superior device and write-in data which was received through the communication interface device are written in an overlapped manner into the same storage location of the physical storage device, they are written in the order of the reception time thereof. More particularly, Yanai fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Yamamoto (U.S. Patent No. 6,701,455) discloses a storage system which preserves data integrity, even when communications line, or similar, errors arise between the local disk system and the remote disk system. When there is no communication line error between the local disk system and the remote disk system, the local disk system sends a time stamp or the write order information with the write data to the remote disk system. This enables the remote disk system to make a copy with data integrity on the disk unit in the remote disk system itself. If there is a communication line error, the remote disk system allocates an empty disk unit and makes a copy with data integrity on the allocated disk unit after the communication line error between the local disk system and the remote disk system is detected. (See, e.g., Abstract and column 1, line 66, through column 2, line 20).

However, unlike the present invention, Yamamoto does not teach or suggest that the storage device system has a table in which the reception times corresponding to each write-in data which is waiting in the temporary storage device are arranged in the order from an older one, and a device for searching write-in data to determine for which data said more than the predetermined time has passed from the reception time. More particularly, Yamamoto fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Kimura (U.S. Patent No. 6,816,951) discloses a method and system for an information storage system comprising a plurality of storage devices receiving write requests from a plurality of host devices that includes a redundant sequence generator arrangement for producing sequence information. The sequence information is associated with the write requests and provides data recovery for data failures. The system may be configured for a single-site configuration that includes two or more sequence generators, or a dual-site configuration that includes two (or more) sequence generators distributed across the dual sites. The sequence generator may be provided internal to the information storage system. The invention also comprises first means for providing sequence information and second means for providing sequence information to produce sequence information used to distinguish the sequence in which write requests are issued from host devices to

information storage devices; and where the first means for providing sequence information and the second sequencing means operate independently of each other. Specifically, the first sequencing means and second sequencing means provide sequence information to the information storage devices through separate routes. The information storage devices then use that sequence information to establish a sequence order of write requests received from the host devices. (See, e.g., Abstract and column 3, lines 29-44, and column 4, line 40, through column 5, line 64).

However, unlike the present invention, Kimura does not teach or suggest that the storage device system has a table in which the reception times corresponding to each write-in data which is waiting in the temporary storage device are arranged in the order from an older one, and a device for searching write-in data to determine for which data said more than the predetermined time has passed from the reception time. More particularly, Kimura fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Ohran (U.S. Patent No. 6,871,271) discloses a method and system for backing up and restoring computer data in the event that data is corrupted or lost. After a mirrored or backup copy has been made, data blocks that are to be overwritten in response to a write request are stored in a preservation memory prior to being overwritten. The data blocks stored in the preservation

memory are time-stamped to designate the chronological order by which the data blocks were overwritten. If data becomes corrupted, the data blocks of the preservation memory are applied to the corrupted data in reverse chronological order until such time that a valid, non-corrupted set of data is obtained. In this manner, data more recent than that associated with the full mirrored or backup copy can be reconstructed. (See, e.g., Abstract and column 2, line 34, through column 3, line 50).

However, unlike the present invention, Ohran does not teach or suggest that the storage device system has a table in which the reception times corresponding to each write-in data which is waiting in the temporary storage device are arranged in the order from an older one, and a device for searching write-in data to determine for which data said more than the predetermined time has passed from the reception time. More particularly, Ohran fails to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims.

Therefore, since the cited references fail to teach or suggest the above described first feature of the present invention recited in independent claims 1 and 5, the above described second feature of the present invention as recited in independent claim 1 and the above described third feature of the present invention as recited in independent claim 5 in combination with the other limitations recited in each of the independent claims, it is submitted that all of

the claims are patentable over the cited references whether taken individually or in combination with each other.

F. Conclusion

Applicant has conducted what it believes to be a reasonable search, but makes no representation that "better" or more relevant prior art does not exist. The United States Patent and Trademark Office is urged to conduct its own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited herein and any other prior art that the United States Patent and Trademark Office may locate in its own independent search. Further, while Applicant has identified in good faith certain portions of each of the references listed herein in order to provide the requisite detailed discussion of how the claimed subject matter is patentable over the references, the United States Patent and Trademark Office should not limit its review to the identified portions but rather, is urged to review and consider the entirety of each reference, and not to rely solely on the identified portions when examining this application.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

G. Fee (37 C.F.R. 1.17(i))

The fee required by 37 C.F.R. § 1.17(i) is to be paid by:

[X] the Credit Card Payment Form (attached) for \$130.00.

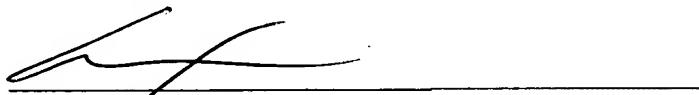
[] charging Account _____ the sum of \$130.00.

A duplicate of this petition is attached.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (501.43387X00).

Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.



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PETITION FEE

Under 37 CFR 1.17(f), (g) & (h)

TRANSMITTAL

(Fees are subject to annual revision)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Application Number	10/750,859
Filing Date	January 5, 2004
First Named Inventor	K. MIKI, et al
Art Unit	
Examiner Name	
Attorney Docket Number	501.43387X08

Enclosed is a petition filed under 37 CFR §1.102(d) that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of \$ 130.00 is enclosed.

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.

Payment of Fees (small entity amounts are NOT available for the petition (fees)

The Commissioner is hereby authorized to charge the following fees to Deposit Account No. 50-1417:

petition fee under 37 CFR 1.17(f), (g) or (h) any deficiency of fees and credit of any overpayments

Enclose a duplicative copy of this form for fee processing.

Check in the amount of \$ _____ is enclosed.

Payment by credit card (From PTO-2038 or equivalent enclosed). Do not provide credit card information on this form.

Petition Fees under 37 CFR 1.17(f):

Fee \$400

Fee Code 1462

For petitions filed under:

§ 1.53(e) - to accord a filing date.
 § 1.57(a) - to according a filing date.
 § 1.182 - for decision on a question not specifically provided for.
 § 1.183 - to suspend the rules.
 § 1.378(e) for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent.
 § 1.741(b) - to accord a filing date to an application under § 1.740 for extension of a patent term.

Petition Fees under 37 CFR 1.17(g):

Fee \$200

Fee code 1463

For petitions filed under:

§1.12 - for access to an assignment record.
 §1.14 - for access to an application.
 §1.47 - for filing by other than all the inventors or a person not the inventor.
 §1.59 - for expungement of information.
 §1.103(a) - to suspend action in an application.
 §1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available.
 §1.295 - for review of refusal to publish a statutory invention registration.
 §1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued.
 §1.377 - for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent.
 §1.550(c) - for patent owner requests for extension of time in ex parte reexamination proceedings.
 §1.956 - for patent owner requests for extension of time in inter partes reexamination proceedings.
 § 5.12 - for expedited handling of a foreign filing license.
 § 5.15 - for changing the scope of a license.
 § 5.25 - for retroactive license.

Petition Fees under 37 CFR 1.17(h):

Fee \$130

Fee Code 1464

For petitions filed under:

§1.19(g) - to request documents in a form other than that provided in this part.
 §1.84 - for accepting color drawings or photographs.
 §1.91 - for entry of a model or exhibit.
 §1.102(d) - to make an application special.
 §1.138(c) - to expressly abandon an application to avoid publication.
 §1.313 - to withdraw an application from issue.
 §1.314 - to defer issuance of a patent.

Name (Print/Type)	Carl I. Brundidge	Registration No. (Attorney/Agent)	29,621
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Signature		Date	June 29, 2005
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This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.